

JEE-Main-27-07-2022-Shift-1 (Memory Based)

Chemistry

Question: Match the following.

(Column I) Ions	(Column II) Disease
(A) Fluoride	(i) Damage kidney
(B) Lead	(ii) Brown mottling of teeth
(C) Sulphate	(iii) Blue Baby syndrome
(D) Nitrate	(iv) Laxative effect

Options:

- (a) A $\rightarrow$ (i); B $\rightarrow$ (iii); C $\rightarrow$ (ii); D $\rightarrow$ (iv)
(b) A $\rightarrow$ (iv); B $\rightarrow$ (iii); C $\rightarrow$ (i); D $\rightarrow$ (ii)
(c) A $\rightarrow$ (iii); B $\rightarrow$ (ii); C $\rightarrow$ (iv); D $\rightarrow$ (i)
(d) A $\rightarrow$ (ii); B $\rightarrow$ (i); C $\rightarrow$ (iv); D $\rightarrow$ (iii)

Answer: (d)

Solution:

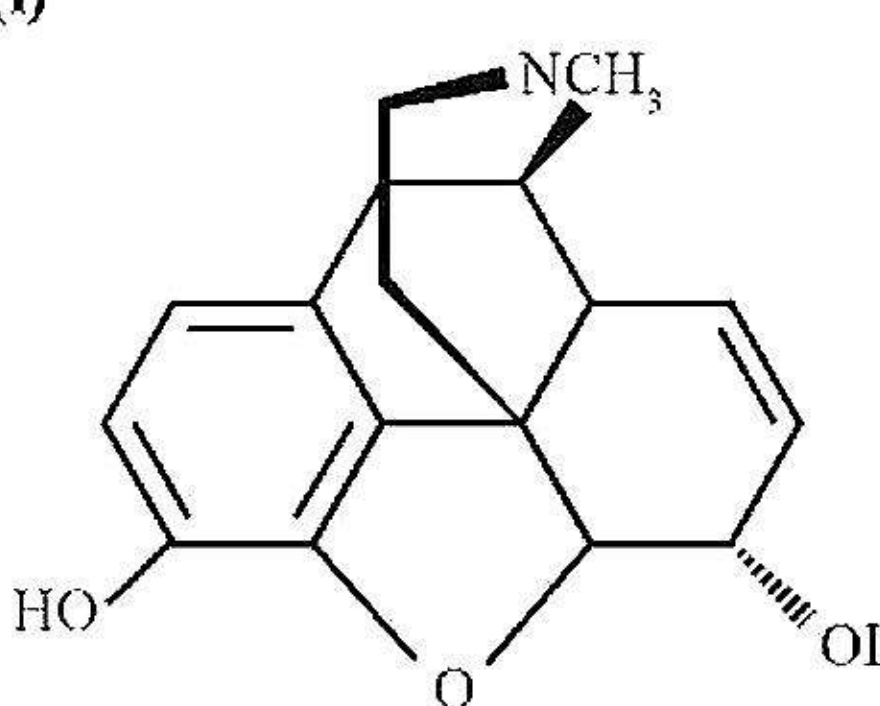
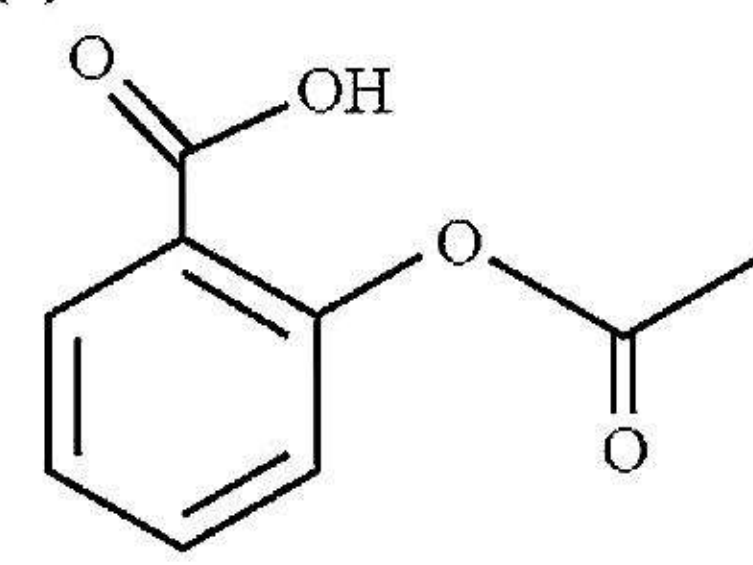
Fluoride $\Rightarrow$ Brown mottling of teeth

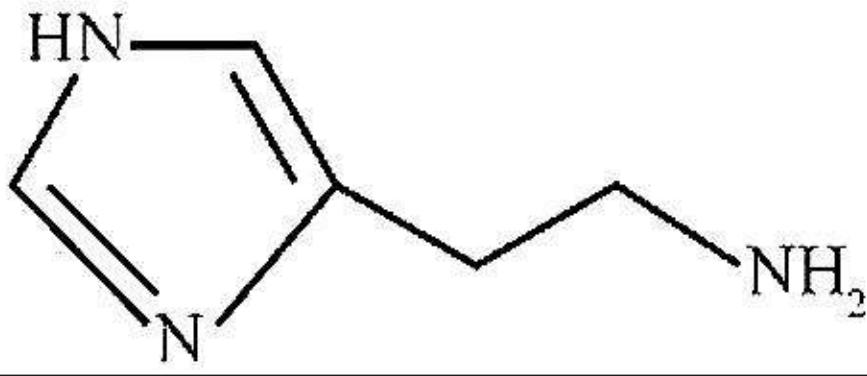
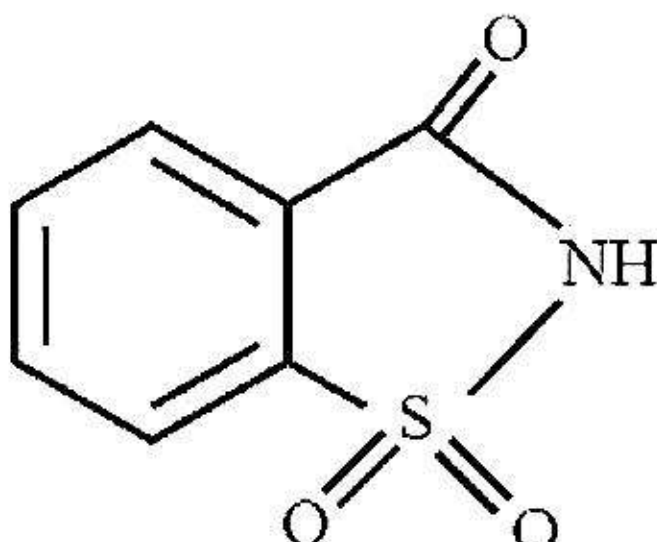
Lead $\Rightarrow$ Damage kidney

Sulphate $\Rightarrow$ Laxative effect

Nitrate $\Rightarrow$ Blue Baby syndrome

Question: Match the following.

(Column I)	(Column II) Structures
(A) Antacids	(i) 
(B) Analgesic	(ii) 
(C) 500 times greater than sugar	(iii)

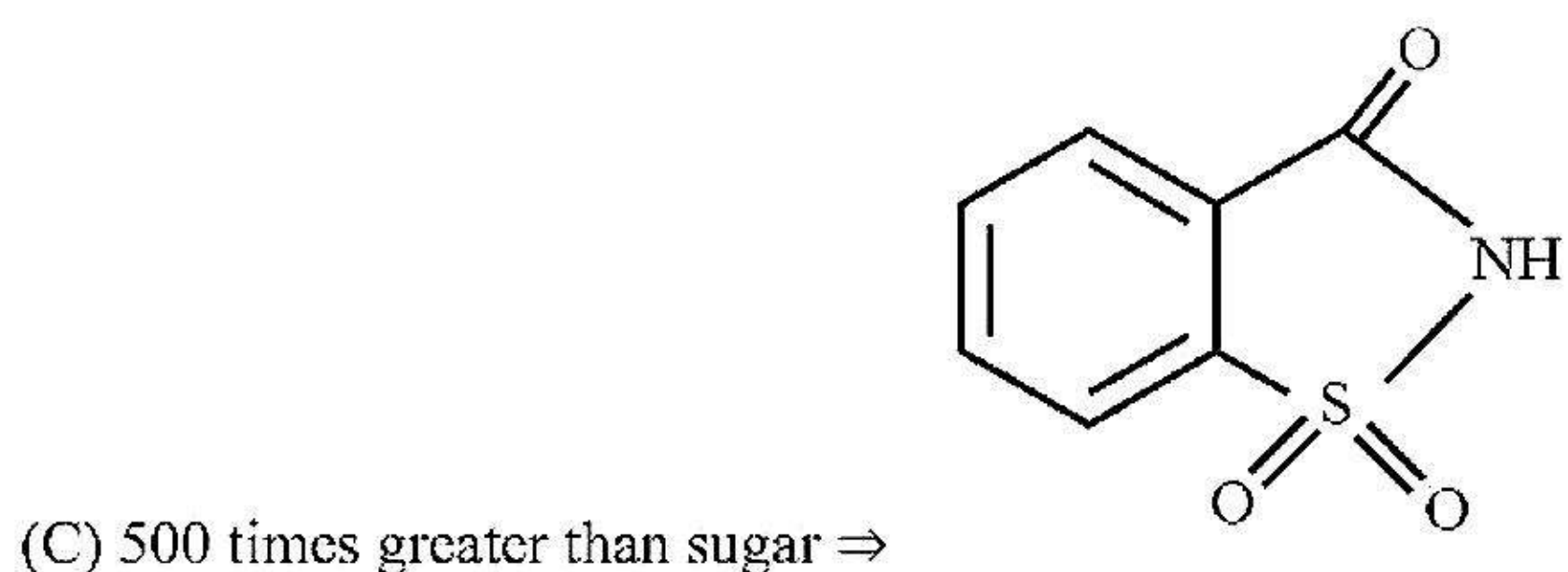
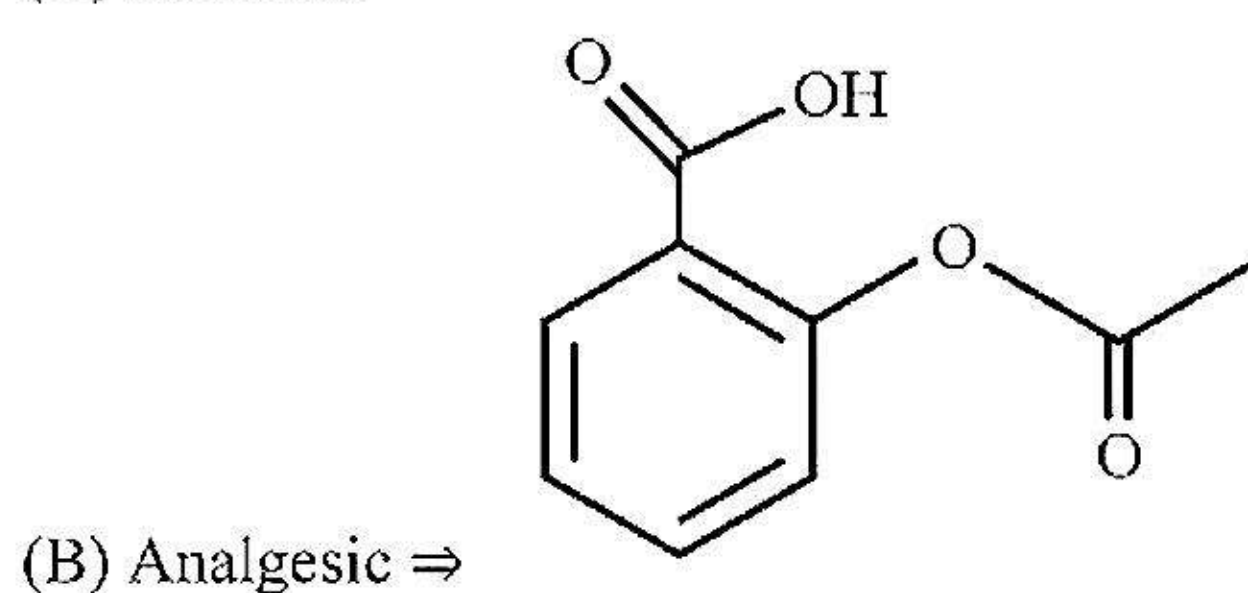
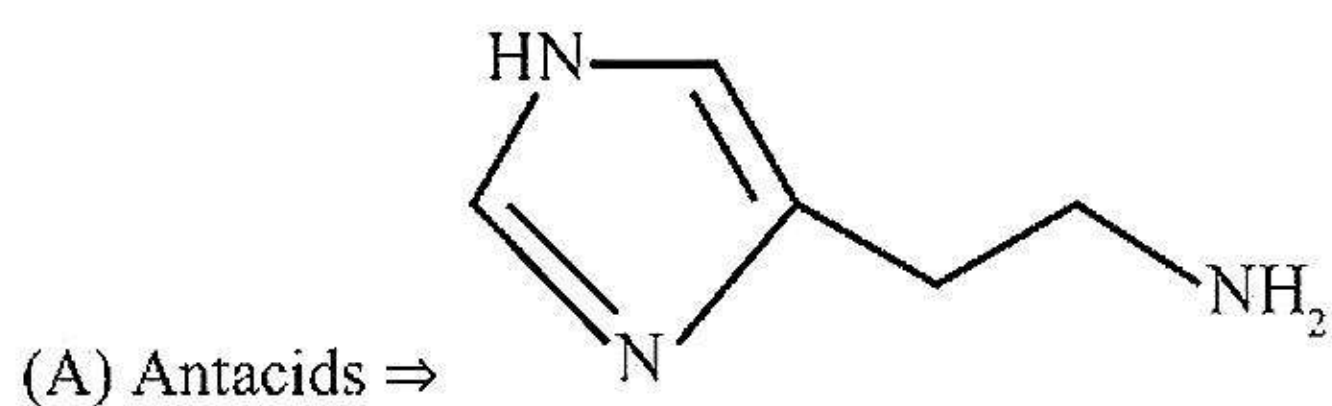
	
(D) Narcotics	(iv) 

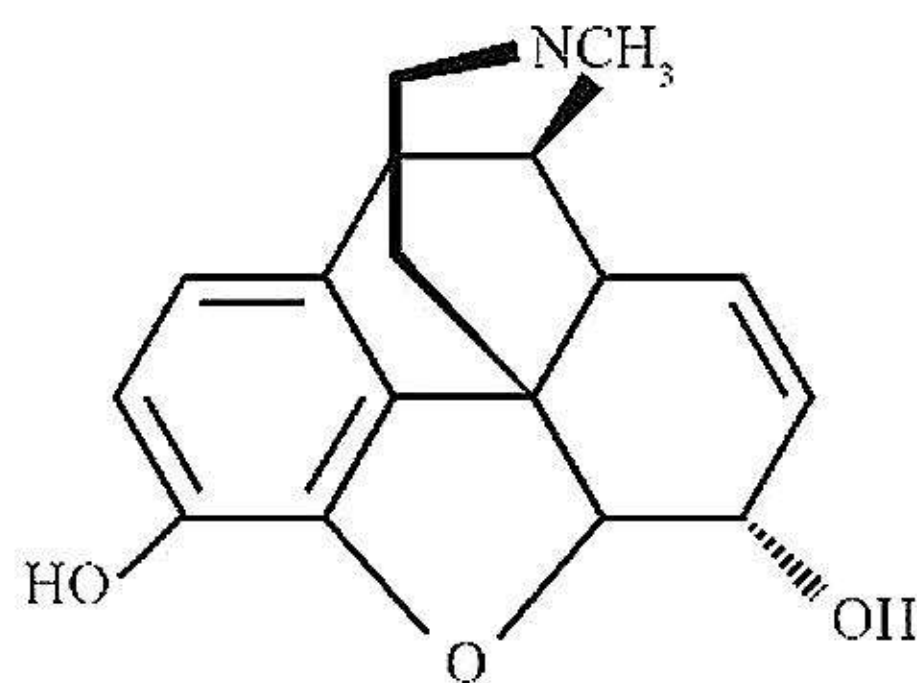
Options:

- (a) A $\rightarrow$ (i); B $\rightarrow$ (iii); C $\rightarrow$ (ii); D $\rightarrow$ (iv)
 (b) A $\rightarrow$ (iv); B $\rightarrow$ (iii); C $\rightarrow$ (i); D $\rightarrow$ (ii)
 (c) A $\rightarrow$ (iii); B $\rightarrow$ (ii); C $\rightarrow$ (iv); D $\rightarrow$ (i)
 (d) A $\rightarrow$ (ii); B $\rightarrow$ (i); C $\rightarrow$ (iv); D $\rightarrow$ (iii)

Answer: (c)

Solution:





(D) Narcotics $\Rightarrow$

Question: Statement -1: H_2O_2 can act as oxidizing agent in both acidic and basic medium

Statement-2: Density of H_2O at 298 K is less than D_2O

Options:

- (a) Both statement 1 and 2 are correct
- (b) Statement 1 is correct but statement 2 is incorrect
- (c) Statement 1 is incorrect but statement 2 is correct
- (d) Both statement 1 and 2 are incorrect.

Answer: (a)

Solution: H_2O_2 can act as oxidizing agent in both acidic and basic medium.

Density of H_2O at 298 K is less than that of D_2O

Therefore, both the statements are true.

Question: Sugar X is reacted with furfural and further reacted with Resorcinol to give a colored compound. Sugar X is

Options:

- (a) Aldopentose
- (b) Aldotetrose
- (c) Carboxylic acid
- (d) Ketotetrose

Answer: (d)

Solution: Seliwanoff's reagent is a mixture of resorcinol and concentrated hydrochloric acid. Ketose sugars react with the Seliwanoff's reagent to give immediately a deep cherry red color.

Question: In D-glucose find molality of Glucose if mass % is 10.8% and weight of solution is 250g.

Options:

- (a) 0.6 m
- (b) 0.06 m
- (c) 6 m
- (d) 2.5 m

Answer: (a)

Solution: Weight of solution = 250 g

Mass % = 10.8%

$$\frac{\text{Mass of glucose}}{\text{Mass of solution}} \times 100 = 10.8$$

$$\text{Mass of glucose} = \frac{10.8}{100} \times 250 = 27 \text{ g}$$

$$\begin{aligned} \text{Molality} &= \frac{\text{Mass of glucose}}{\text{Molar mass of glucose}} \times \frac{1000}{\text{wt. of solution}} \\ &= \frac{27}{180} \times \frac{1000}{250} = 0.6 \text{ m} \end{aligned}$$

Question: Boiling point of non volatile solution A and B are same. Mass percent of sol A is 2% and mass percent of sol B is 3%. What is the ratio of their Mol. mass?

Options:

- (a) $M_A = 4M_B$
- (b) $M_B = 4M_A$
- (c) $3M_A = 2M_B$
- (d) $3M_B = 2M_A$

Answer: (c)

Solution:

$$(\Delta T_b)_A = (\Delta T_b)_B$$

$$K_b m_A = K_b m_B$$

$$\frac{2}{M_A \times 98} = \frac{3}{M_B \times 97}$$

$$2M_B = 3M_A$$

Question: Statement-1: Cl^- of $\text{Al}(\text{Al}_2\text{Cl}_6)$ and $\text{Be}(\text{BeCl}_2)$ form bridged structure and acts as Lewis base

Statement-2: Hydrolysis of aluminium and beryllium reacts with excess of alkalis to give beryllate and aluminate ion

Options:

- (a) Both statement 1 and 2 are correct
- (b) Statement 1 is correct but statement 2 is incorrect
- (c) Statement 1 is incorrect but statement 2 is correct
- (d) Both statement 1 and 2 are incorrect

Answer: (c)

Solution: Beryllium hydroxide dissolves in excess of alkali to give a beryllate ion, $[\text{Be}(\text{OH})_4]^{2-}$ just as aluminium hydroxide gives aluminate ion, $[\text{Al}(\text{OH})_4]^-$.

The chlorides of both beryllium and aluminium have Cl^- bridged chloride structure in vapour phase. Both the chlorides are soluble in organic solvents and are strong Lewis acids. They are used as Friedel Craft catalysts.

Question: The name of oxyacid of phosphorus having max no. of oxygen

Options:

- (a) Hypophosphorous acid
- (b) Pyrophosphoric acid
- (c) Phosphorus acid
- (d) Phosphoric acid

Answer: (b)

Solution:

Hypophosphorous acid $\Rightarrow \text{H}_3\text{PO}_2$

Pyrophosphoric acid $\Rightarrow \text{H}_4\text{P}_2\text{O}_7$

Phosphorus acid $\Rightarrow \text{H}_3\text{PO}_3$

Phosphoric acid $\Rightarrow \text{H}_3\text{PO}_4$

Question: What are the monomer of Glyptal, Buna-S?

Options:

(a) Glyptal – Phenol, Formaldehyde; Buna-S – Styrene

(b) Glyptal – Ethylene, Glycol, Phthalic acid; Buna-S – 1,3-Butadiene, Styrene

(c) Glyptal – Phenol, Phthalic acid; Buna-S – 1,3 Butadiene, Acrylonitrile

(d) Glyptal – Urea, Formaldehyde; Buna-S – 1,3 Butadiene, Propene

Answer: (b)

Solution: Monomers of Glyptal are Ethylene Glycol, Phthalic acid

Monomers of Buna-S are 1,3-Butadiene, Styrene

Question: Find out the solubility product of CaF_2 if solubility of CaF_2 is 2.34 g/100 mL

Options:

(a) $0.108 (\text{mol/L})^3$

(b) $0.072 (\text{mol/L})^3$

(c) $0.036 (\text{mol/L})^3$

(d) $0.032 (\text{mol/L})^3$

Answer: (a)

Solution: Solubility = $\frac{2.34}{100} \text{ g/ml}$

Molar mass of $\text{CaF}_2 = 40 + 19 + 19 = 78 \text{ g/mol}$

Solubility in $(\text{mol/L}) = \frac{2.34}{78} \times \frac{1000}{100} \text{ mol/L} = 0.3 \text{ mol/L}$

$\text{CaF}_2 \rightleftharpoons \underset{s}{\text{Ca}^{2+}} + \underset{2s}{2\text{F}^-}$

$K_{sp} = s \times (2s)^2 = 4s^3$

$K_{sp} = 4 \times (0.3)^3 = 0.108 (\text{mol/L})^3$

Question: Change in oxidation state of C when oxalic acid reacts with acidic KMnO_4

Options:

(a) 5

(b) 2

(c) 1

(d) 3

Answer: (c)

Solution: $2\text{MnO}_4^- + 16\text{H}^+ + 5\overset{+3}{\text{C}}_2\overset{+4}{\text{O}}_4^{2-} \rightarrow 2\text{Mn}^{2+} + 10\overset{+4}{\text{CO}}_2 + 8\text{H}_2\text{O}$

Question: Assertion: Hydrogen's 2s orbital has more energy than lithium's 2s orbital

Reason: For same orbital, as atomic number increases energy decreases

Options:

- (a) Both assertion and reason are true, reason is correct explanation of assertion.
- (b) Both assertion and reason are true, but reason is not a correct explanation of the assertion.
- (c) Assertion is true, but reason is false
- (d) Assertion is false, but reason is true

Answer: (a)

Solution: An increase of atomic number is in the order, $H < Li$

Energies of the orbitals in the same subshell decrease with an increase in the atomic number.

Hence, 2s orbital (energy level) of Li will be less than H

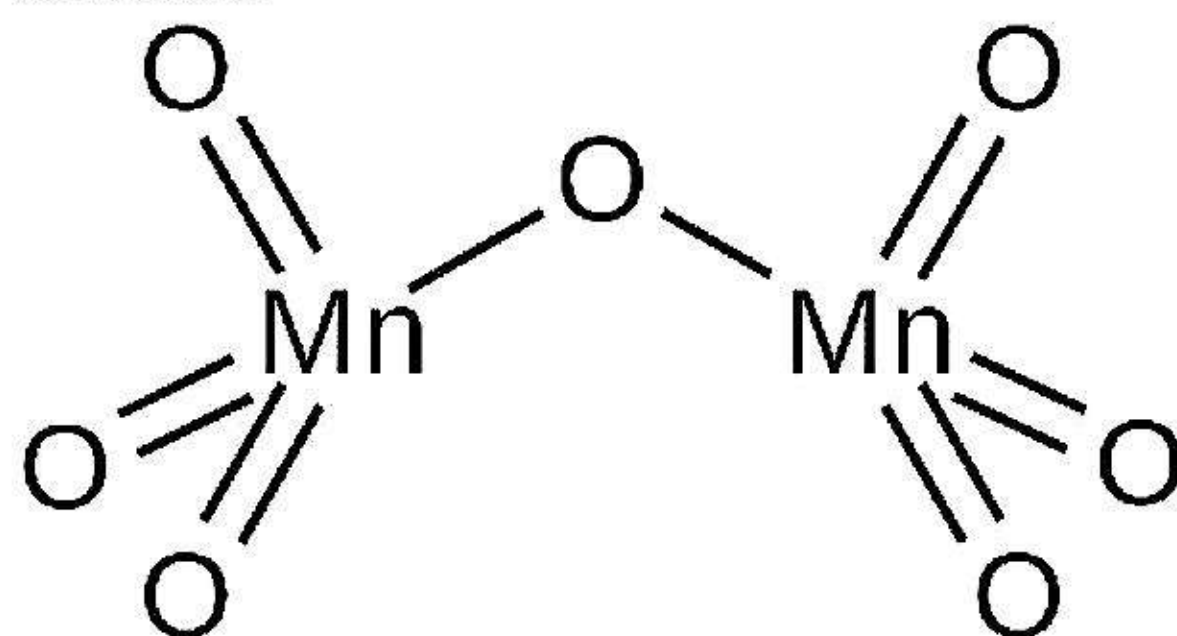
Question: The number of Mn = O bond in Mn_2O_7

Options:

- (a) 7
- (b) 4
- (c) 5
- (d) 6

Answer: (d)

Solution:



Question: After 30 sec, product was 1/16 of reactant. Calculate half life?

Answer: 330.00

Solution:

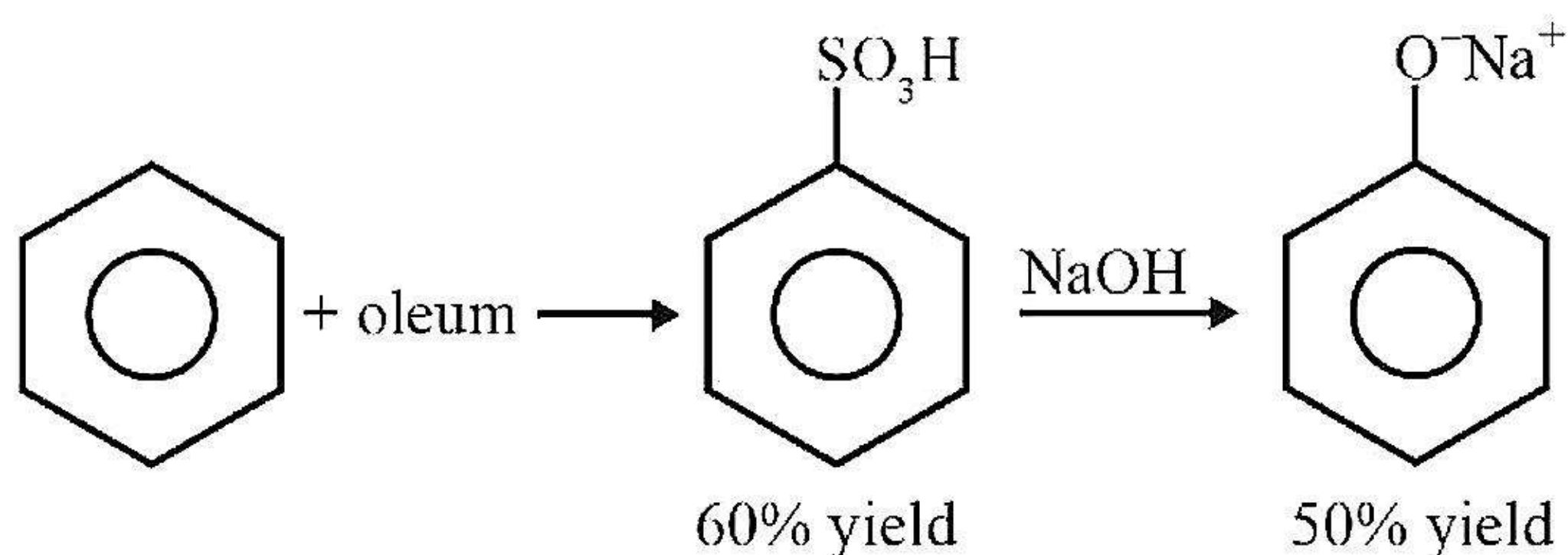
$$k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$$

$$k = \frac{2.303}{30} \log \frac{16}{15}$$

$$k = 0.0021$$

$$t_{1/2} = \frac{0.693}{0.0021} = 330 \text{ s}$$

Question: The percentage yield of the complete reaction is



Answer: 30.00

Solution: Percentage yield of complete reaction = $\frac{60}{100} \times \frac{50}{100} \times 100 = 30\%$

Question: Number of species having identical Bond order

CN⁻, NO⁺, O₂, O₂⁺, O₂²⁺

Answer: 3.00

Solution:

1) O₂(16) = $\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 2p_z^2 \pi 2p_x^2 = \pi 2p_y^2, \pi^* 2p_x^1 = \pi^* 2p_y^1$

Bond order = $\frac{10-6}{2} = 2$

2) NO⁻(14) = Bond order = $\frac{10-4}{2} = 3$

3) O₂⁺(15) = Bond order = $\frac{10-5}{2} = 2.5$

4) O₂²⁻(14) = Bond order = $\frac{10-4}{2} = 3$

5) CN⁻(14) = Bond order = $\frac{10-4}{2} = 3$

NO⁻, CN⁻, and O₂²⁻ has identical bond order

Question: How many of the following are not the ways to purify metal?

Distillation, Liquation, Electrolysis, Leaching, Calcination

Answer: 2.00

Solution: Leaching and calcination are not the method to purify metal.

Question: 20 ml of 0.02 M K₂Cr₂O₇ is titrated against 10 mL Fe²⁺ solution. The molarity of Fe²⁺ is $___ \times 10^{-2}$.

Answer: 24.00

Solution: $\text{Cr}_2\text{O}_7^{2-} + \text{Fe}^{2+} + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + \text{Fe}^{3+} + 7\text{H}_2\text{O}$

The redox changes involved are

i) $6\text{e}^- + \text{Cr}_2\text{O}_7^{2-} \rightarrow 2\text{Cr}^{3+}$ (n = 6)

ii) $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{e}^-$ (n = 1)

Milliequivalent of $\text{Cr}_2\text{O}_7^{2-}$ = Milliequivalent of Fe²⁺

$20 \times 0.02 \times 6 = 10 \times N$

N = 0.24

$$\begin{aligned}
 M &= \frac{N}{\text{'n' factor}} = \frac{0.24}{1} \\
 &= 0.24 \text{ M} \\
 &= 24 \times 10^{-2} \text{ M}
 \end{aligned}$$